

**RTCA Special Committee 186, Working Group 5**

**ADS-B UAT MOPS**

**Meeting #11**

**Draft 1 of Appendix F:  
Link Budgets and Scenario Dependent Ranges**

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<b>SUMMARY</b>
<b>This is Draft 1 of the Appendix F: Link Budgets and Scenario Dependent Ranges. This document is identical in format to Appendix E of DO-260 in order to make the two easily comparable.</b>



## **Appendix F**

### **Link Budgets and Scenario Dependent Ranges**

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## F.1 Transmitter and Receiver Power Requirements

The requirements given in Section 2.2 for transmitter power and receiver MTL were selected based upon consideration of the air-to-air ranges at which ADS-B report update requirements were levied in the ADS-B MASPS (RTCA DO-242): 10 NM for Class A0, 20 NM for Class A1, 40 NM for Class A2, and 90 NM for Class A3. The following air-to-air link budgets summarize the relationships, for each class of ADS-B equipment, between transmitter power, receiver MTL, and range (for a 90 percent reception probability, in an interference-free environment, of each ADS-B message) under worst-case conditions for transmitter power and receiver MTL. Performance in likely practical implementations, translated into the context of the MASPS received report update requirements, is summarized in the note that follows.

**Table F-1: Air-To-Air MTL Link Budgets**

Equipment Class		A0/A1L	A1H/A2	A3
Basic Requirements	Transmitter power (dBm at antenna)	38.5 to 42.5	42 to 46	48 to 52
	Receiver MTL (dBm at antenna)	< = -93	< = -93	< = -93
Transmitter power	dBm at Antenna, worst case (minimum power)	38.5	42	48
Antenna gain, Transmitter	dBi	0	0	0
Antenna gain, Receiver	dBi	0	0	0
Received power	dBm at Antenna	-93	-93	-93
MTL	dBm at Antenna, worst case (minimum MTL)	-93	-93	-93
Available Path Loss	dB	131.5	135	141
Link Budget Ranges	NM	50	74	148

**Note:** These link budget ranges were developed assuming a receiver duty factor of 0.95. However, other factors that will be present in practical installations were not considered. These other factors include better-than-worst-case transmitter power and receiver MTL, antenna gain variations, and receptions below MTL. These factors may be expected to support operation with 95 percent of the user

*population at the ADS-B report update requirements specified in the MASPS, under realistic conditions at ranges as follow:*

*R = 60 NM for class A0/A1L (assumed Tx/Rx antenna mean gain = 0 dBi),*

*R = 90 NM for Class A1H/A2 (assumed Tx/Rx antenna mean gain = 0 dBi),*

*R = 230 NM for Class A3 (assumed Tx/Rx antenna mean gain = 0 dBi)*

*These are power-limited ranges that apply in the absence of interference. In a high interference environment, corresponding to that expected in Los Angeles in 2020, the 95<sup>th</sup> percentile ranges are approximately:*

*R = 25 NM for Class A0/A1L,*

*R = 40 NM for Class A1H/A2, and*

*R = 90 NM for Class A3.*

*These estimates include interference associated with both surface and air traffic distributions, co-site interference, and the agreed JTIDS scenario.*